

TA-2050

Stereo Cassette Tape Deck

Instruction Manual

ONKYO

Features

Special Hard Permalloy Head Designed for Metal Tapes

The special process used to obtain the extra hard permalloy head surface ensures greater resistance to wear and a better saturation magnetic density in order to gain full advantage of high performance metal tapes.

The hyperbolic head shape also improves head-to-tape contact.

Extremely Quiet and Accurate 2-Motor DD-Motor Drive

The integrated motor/flywheel DD motor drive mechanism featured in the TA-2050 is particularly effective in reducing level deviations, intermodulation distortion, and wow and flutter.

Dolby Noise Reduction System and MPX Filter

The built-in Dolby NR system eliminates much of the annoying tape hiss without affecting the quality of sound reproduction. By incorporating the circuit in a single-chip 2-channel monolithic IC, optimum noise reduction performance is achieved. In addition, the TA-2050 also features a built-in MPX filter which removes the pilot signal from FM broadcasts for brilliant high quality recordings.

Peak Level Meters

Accurate indication of the rapidly changing peak level values enables recording levels to be set far more precisely than average-level reading VU meters.

ACCUBIAS Adjust System

The amount of bias current applied to the tape during recording has a great effect on frequency response, not to mention distortion and signal-to-noise ratio. Since the optimum bias current for any tape depends on that tape's magnetic characteristics, you need a way of varying the bias for each tape type. ACCUBIAS goes beyond conventional tape selectors to find the accurate bias for each type of tape you use.

Feather-Touch Controls Plus Electronic Logic

Besides streamlining tape deck operations with efficient and easy to use feather-touch push-button controls, the TA-2050 is also equipped with electronic logic circuits to protect both tapes and motor from undue strain.

Audio Timer Start

When connected to an optional audio timer (such as the AT-5), the TA-2050 may be used to record those not-to-be-missed programs when you are out or which are broadcast very late at night. In the playback mode, the audio timer can be used as an alarm to wake you up in the morning to your favorite music. And since the transport mechanism and the motor are turned off after the end of recording or playback, both tape and transport mechanism are protected from undue strain and possible damage.

Fade Out Mechanism

This convenient function enables the end of recorded tapes to be erased gradually for smooth fade outs instead of the sudden cut-offs experienced when the program does not fit on the tape. Note that this is an independent control designed to avoid accidental use.

Remote Control Unit Terminal

With an optional remote control unit (such as the RC-5), the TA-2050 can be controlled even while you are relaxing in your favorite chair. All transport modes are included (record, play, fast forward, rewind, stop and pause).

3-Step Eq/Bias Tape Selector

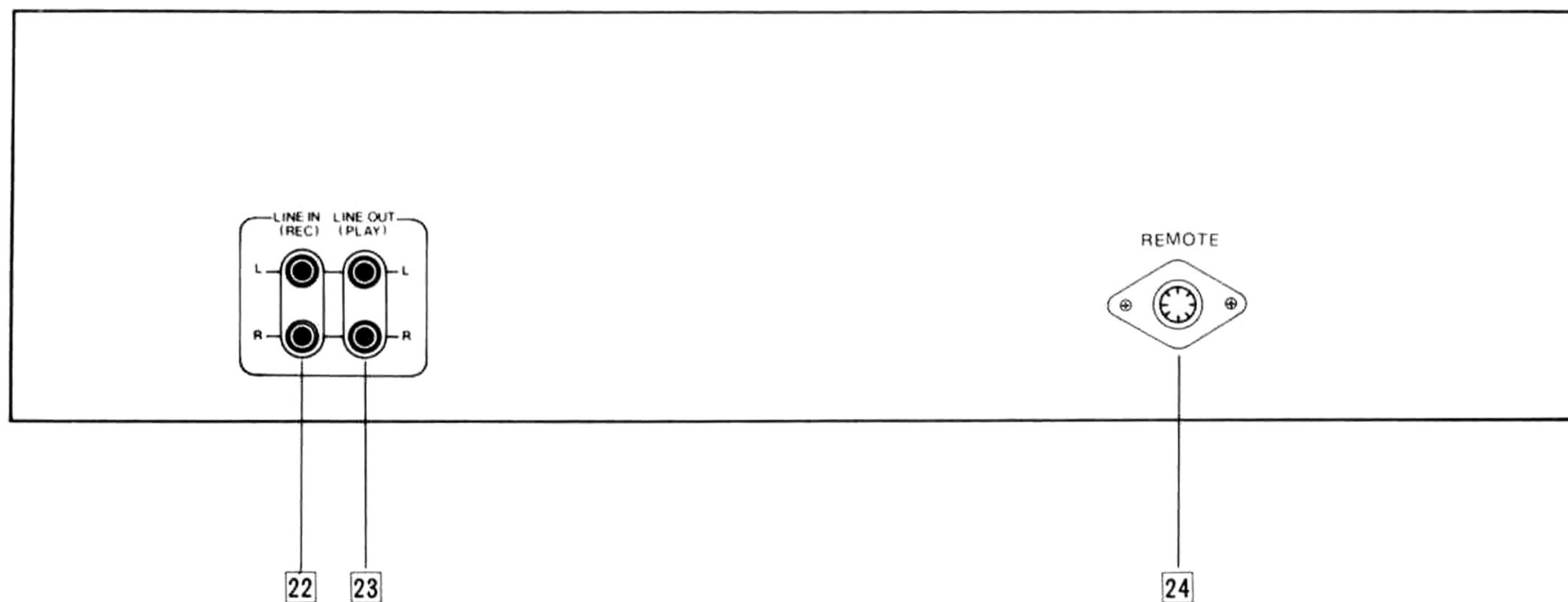
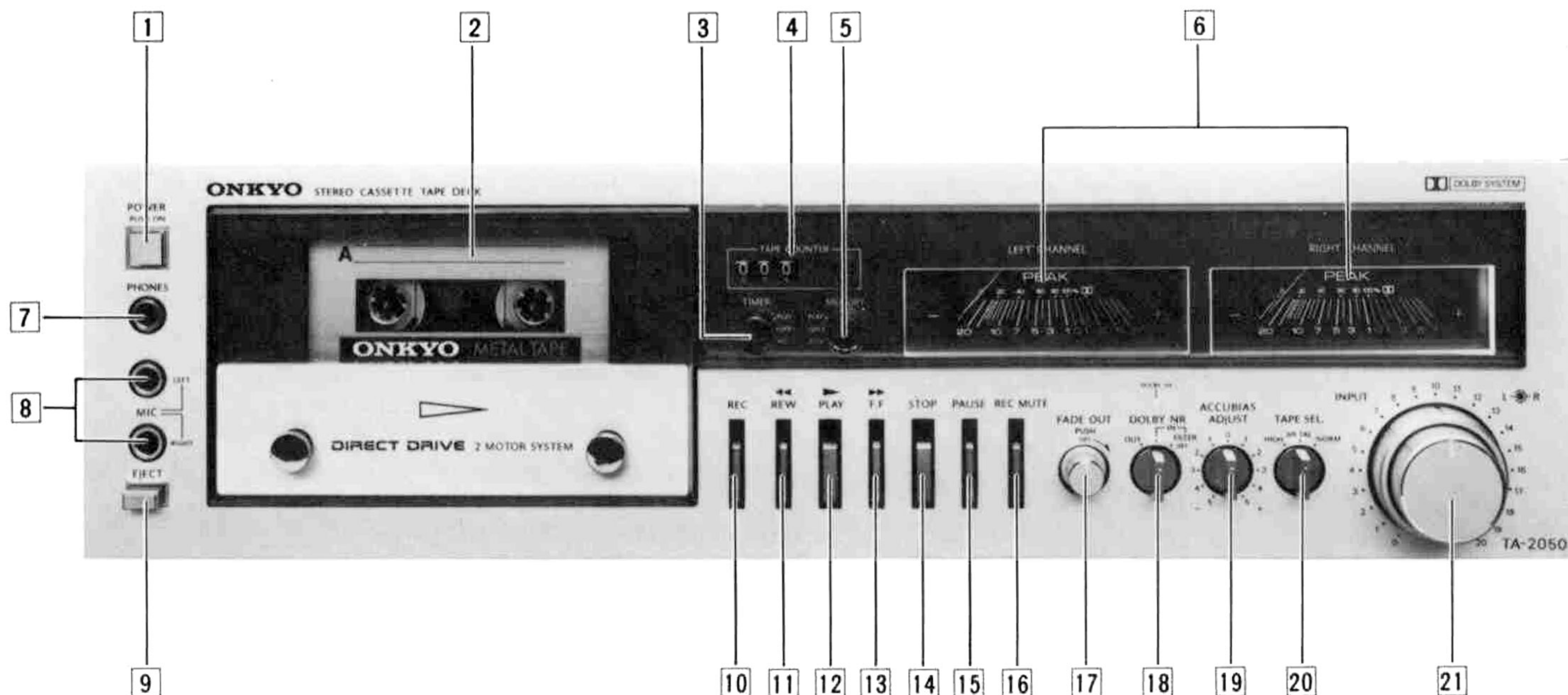
The TA-2050 has been designed to handle all types of tapes available on the market, including the high performance metal tapes.

Convenient Memory Operation

The memory stop and memory play mechanism is particularly useful for repeated play of any desired tune, and also for checks of just-recorded programs.

Cautions and Suggestions

1. This deck must always be operated in the horizontal position.
2. Do not use or leave in direct sunlight, or in other places of high temperature and humidity. Nor should the deck be left in potentially hot places such as near heating appliances. Excessive heat and moisture can lead to internal damage and serious failures (this also applies to cassette tapes). The recommended ambient temperature range is 5°C to 35°C.
3. Avoid damp and dusty places, and positions prone to vibrations.
4. Be extremely careful with the recording/playback head. Clean and demagnetize regularly (see pg. 9), but under no circumstances must magnets or other metals be used anywhere near the heads.
5. The TA-2050 is extremely sensitive to magnetic fields, so do not use near large speakers or other devices which generate magnetic fields.
6. Hum may even be induced by magnetic flux leakage from the power transformer in certain amplifiers. Consequently, also keep the TA-2050 clear of the amplifier unit.
7. Do not remove the cabinet case. If any of the internal parts are handled, there is considerable danger of electric shock.
8. Protect the deck from spillage, inflammables, and knocks from heavy objects.
9. The power cord should be disconnected when not being used for any considerable length of time.



Front and Rear Panel Facilities

- | | | | |
|----|--|----|---|
| 1 | POWER Switch | 13 | Fast Forward Button (►► FF) |
| 2 | Cassette Door | 14 | STOP Button (STOP) |
| 3 | TIMER Switch (PLAY, OFF, REC) | 15 | PAUSE Button (PAUSE) |
| 4 | TAPE COUNTER | 16 | Record Muting Button (REC MUTE) |
| 5 | MEMORY Switch (PLAY, OFF, STOP) | 17 | FADE OUT Control knob (FADE OUT) |
| 6 | Level Meters (LEFT Channel, RIGHT Channel) | 18 | Dolby NR Switch (DOLBY NR, OUT/IN/FILTER OFF) |
| 7 | Headphone Jack (PHONES) | 19 | ACCUBIAS Adjust Switch (ACCUBAS ADJUST) |
| 8 | MIC Input Jacks (LEFT, RIGHT) | 20 | TAPE Selector Switch (METAL/HIGH/NORM) |
| 9 | EJECT Button (EJECT) | 21 | Input Recording Level Controls (INPUT Left/Right) |
| 10 | Record Button (REC) | 22 | LINE IN (REC) |
| 11 | Rewind Button (◀◀ REW) | 23 | LINE OUT (PLAY) |
| 12 | PLAY Button (► PLAY) | 24 | Remote Control Connector (REMOTE) |

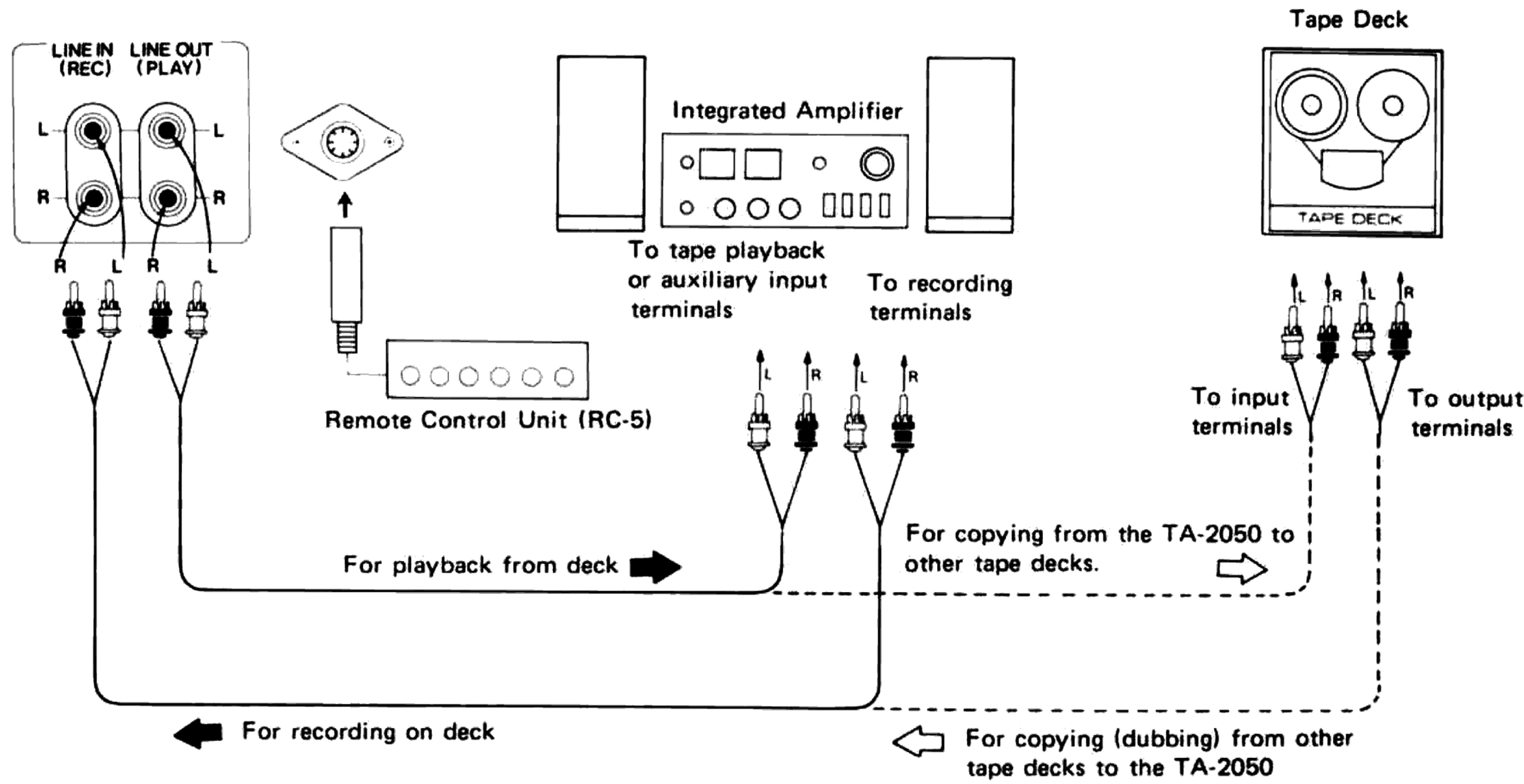
*** **WARNING** ***
TO PREVENT FIRE OR SHOCK HAZARD,
DO NOT EXPOSE THIS APPLIANCE TO
RAIN OR MOISTURE.

- “DOLBY” AND THE “DOUBLE-D” SYMBOL ARE TRADEMARKS OF THE DOLBY LABORATORIES. MANUFACTURED UNDER LICENSE FROM DOLBY LABORATORIES.
- THE CABINET COMPOSITION OF THIS UNIT IS VINYL LAMINATED STEEL SHEET.
- Recording of copyrighted material for other than personal use is illegal without permission of the copyright holder.

System Connections

All connections should be made with the power OFF.

Hook up to amplifiers or other tape decks:



Mic Jacks

Although microphones in the $600\Omega - 50k\Omega$ impedance range are quite acceptable, those in the $10k\Omega - 50k\Omega$ range will give the best results.

Headphone Jack

Dynamic type headphones with a rated impedance in the $8\Omega/200\Omega$ range are recommended.

Remote Control Connector

When using a remote control unit, connect the Onkyo RC-5 remote control unit (sold separately) to this connector.

Common Modes of Operation

Since initial system connections are of critical importance, check once again that all connections have been completed exactly as indicated in the connections diagram on page 5. Then, before turning the POWER switch [1] ON, check that the Timer switch [3] is in the OFF position.

Inserting Cassette Tapes

1. Depress the EJECT button [9] to open the cassette door [2].
2. Insert the tape cassette with the exposed tape face down and the side to be played back facing out.
3. Close the cassette door by pressing against the center.

Playback

1. Check that the Timer switch [3] is OFF before turning the power ON. Then switch the Tape Selector [20] to the appropriate position (see the tape selector guide on page 7).
2. Set the Dolby NR control [18] to the IN position when playing back Dolby NR recorded tapes, but to the OUT position when playing non-Dolby NR recorded tapes. Then depress the ► PLAY button [12] to commence playback. Adjust the volume and tone with the amplifier front panel controls.
3. If the tape is played to the end, the auto-stop mechanism will stop the tape automatically. To stop the tape at any other time, simply depress the STOP button [14]. For temporary stops, depress the PAUSE button [15], resuming playback by depressing the ► PLAY button [12].
4. After the tape has stopped and the play lamp has turned off, depress the EJECT button [9] to open the cassette door and replace the tape.

Recording

1. Check that the Timer switch [3] has been set to the OFF position before switching the power ON.
2. After checking that the erasure prevention tabs along the back end of the cassette are still intact (see page 7), insert the tape with the side to be recorded face out. If the erasure prevention tabs have already been removed, it will not be possible to record with that tape.
3. Switch the Tape Selector [20] to the appropriate position (refer to the tape selector guide on page 7).
4. Reset the tape counter [4] to '000'. By noting the counter readings later on at various parts of the tape, it will be easier to locate different sections for editing and rechecking purposes.
5. While pressing the PAUSE button [15] depress the RECORD button [10]. Although the record lamp will light up, the tape will remain stationary. The peak meters will indicate the input level of the signal applied to the rear panel input terminals or microphone jacks.
6. Adjust the input level shown in the meters to a suitable recording level by means of the Input Recording Level controls [21]. Refer to the following section on proper recording level adjustment for further details.
7. When the ► PLAY button [12] is depressed, the actual recording will begin.
8. When the end of the tape is reached, the tape will be stopped automatically by the auto-stop mechanism. To stop tape transport at any other time during the recording, depress the STOP button [14]. For a temporary stop, depress the PAUSE button [15]. To

edit out unwanted commercials and announcements, depress the Record Muting button [16] for a second or two before depressing the pause button.

- If the recording level has already been properly adjusted, recording can be started immediately by pressing the ► PLAY button [12] while holding the RECORD button [10] down. Note that recording can not be started by depressing the ► PLAY button [12] before depressing the RECORD button [10].

Fast Forward and Rewind Modes

Depress the ►► FF button [13] to wind the tape forward rapidly onto the right hand reel; depress the ◀◀ REW button [11] to rewind the tape back onto the left hand reel. Note that the tape will not stop if the PAUSE button [15] is depressed during either the fast forward or rewind mode. The tape will only stop when the STOP button [14] is depressed or when the end of the tape is reached (auto-stop mechanism).

Proper Recording Level Adjustment

The recording level setting used during recordings has a big effect on the quality of sound reproduction during playback. If the input level is set too high during recordings, the playback sound will be seriously distorted. If, on the other hand, the input level is too low during recording, background noise will become prominent in the playback sound (i.e. a bad S/N ratio). The thickness of the magnetic layer in cassette tapes is considerably thinner than open reel tapes. The saturation point is consequently much lower which means that the sound will be distorted easily when recording at very high recording levels.

For proper recording level adjustment, turn the input Recording Level controls [21] to obtain suitable level meter readings. For high S/N ratio and wide dynamic range recordings, the recording level needs to be set as high as possible, but not so high that it causes distortion. Since the TA-2050 features extremely accurate peak level meters, it is possible to record at levels very close to the maximum saturation point for the tape.

The Dolby Noise Reduction System

Due to the practical limitations in size and speed of cassette tapes, unwanted background "hiss" noise which is particularly noticeable in the higher frequency range is included in the playback signal. The Dolby Noise Reduction system has been developed to reduce this hiss, resulting in playback of cleaner, noise-free sound. Essentially, the Dolby system simply boosts low amplitude high frequencies during the recording process and reduces them again along with the background hiss during playback. The noise is thereby effectively reduced without any final change in the recorded program. In the TA-2050, the 1 kHz to 5 kHz frequency range is boosted by 5 dB, and frequencies above 5 kHz boosted by 10 dB during recording. Tape hiss is consequently reduced by 5 dB and 10 dB respectively in these ranges during playback. Any Dolby* encoded tape must be played back with the Dolby NR switch IN while any non-Dolby* encoded tape must be played back with the Dolby NR switch OUT. Otherwise, the quality of sound during playback will be seriously affected.

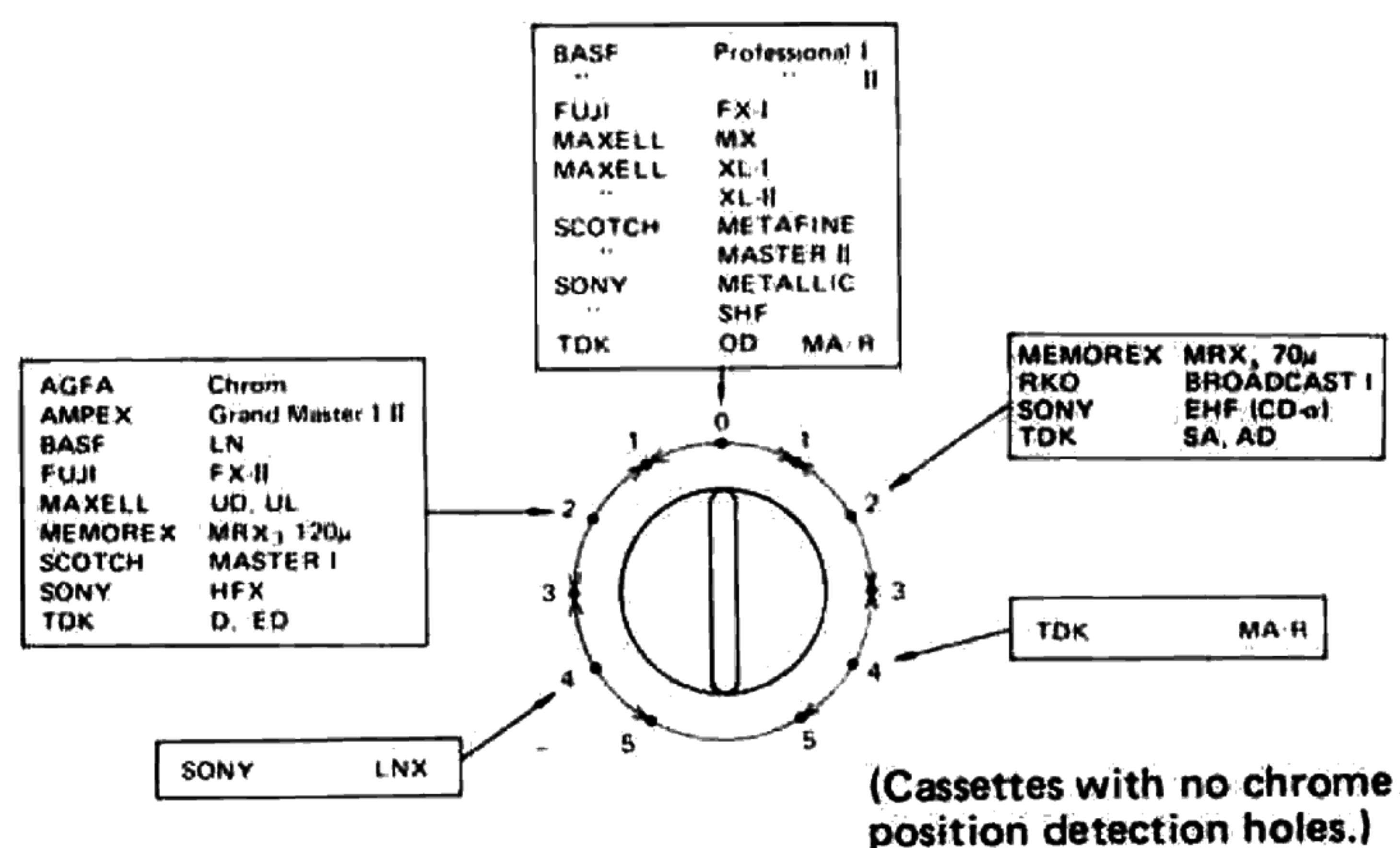
The TA-2050 also features an FM multiplex pilot signal filter coupled to the Dolby NR switch. Since leakage of the 19 kHz multiplex pilot signal interferes with the Dolby circuit, the Dolby NR switch must be set to the DOLBY NR IN FILTER IN position when making Dolby* encoded tapes from FM stereo broadcasts. For Dolby* encoded recordings of other program sources, the MPX filter should be switched OFF.

Special Modes of Operation

ACCUBIAS Adjust System

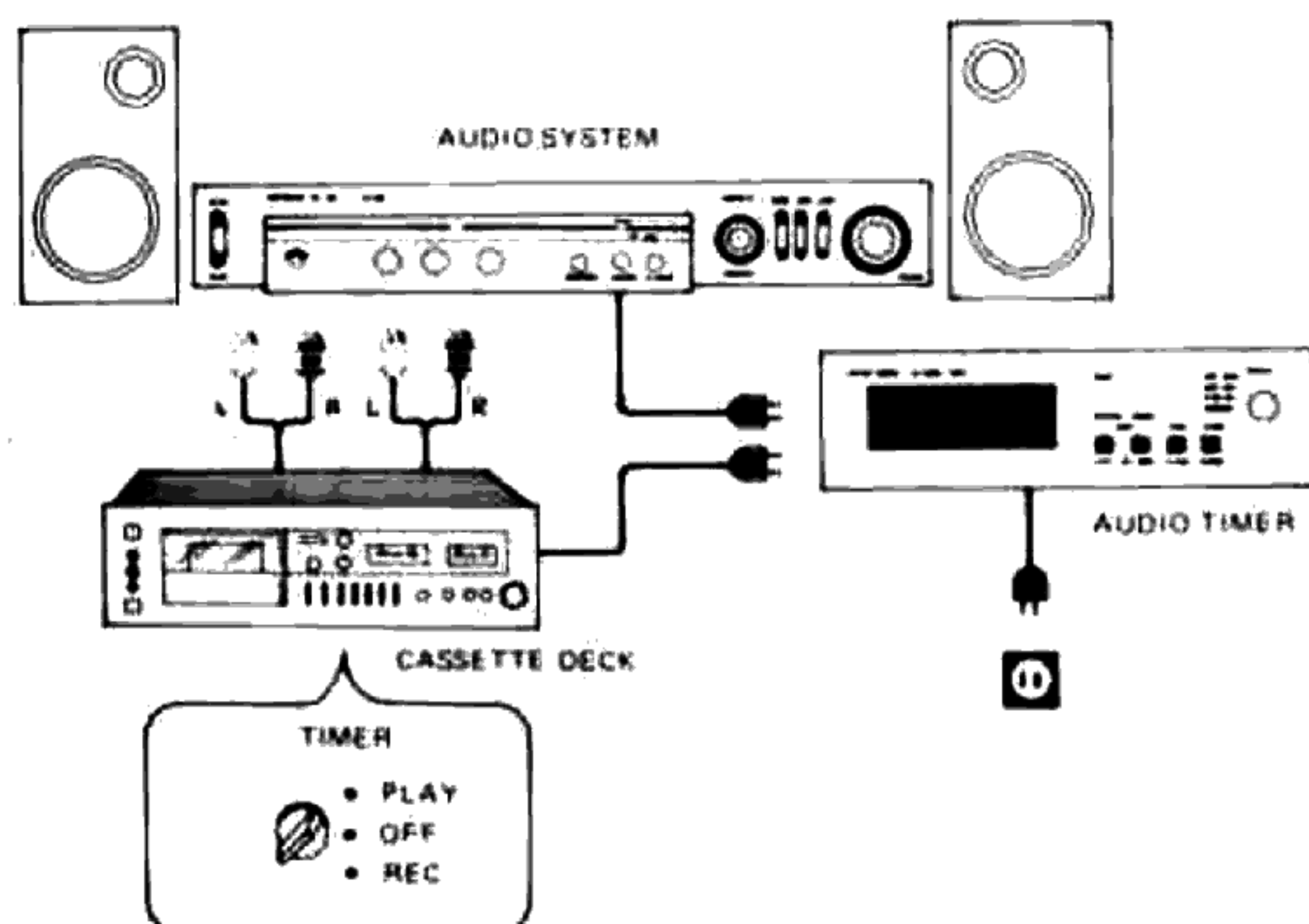
Although the tape deck is equipped with an ACCUBIAS system for fine bias adjustment, with most tapes you will get excellent results by just leaving the bias adjustment knob in the center clickstop position.

Nevertheless, some tapes may require additional bias adjustment in order to give flat frequency response. In those cases, refer to the following diagram. For tapes not listed, use the 0 setting.



Timer Recording and Playback

When connected to an audio timer (optional), the TA-2050 can be set for preset timer recording and playback. Connect the tape deck and the rest of the audio system up to the audio timer as shown in the following diagram and test the arrangement several times to check that timer recording and playback proceed properly.



- (1) For timer recording, tune to the desired broadcast station and adjust the tape deck input level to the proper recording level. Then set the timer to switch the power on at the desired time, and set the TA-2050 timer switch [3] to the REC position.
 - Note that the power switches of the TA-2050 and the audio system must be left ON.
 - If no sound is required from the speakers during the actual recording, turn the amplifier volume control down.
- (2) For use as a morning alarm (timer playback), set the TA-2050 and audio system for normal playback, then set the audio timer to switch on the power at the desired time. Next set the timer switch [3] to the PLAY position, remembering to leave the relevant power switches in the ON positions.

Fade Out Function

To fade out the sound at the end of a recording, depress the Fade Out control [17] and turn it slowly clockwise as far as it will go. Fade out should be performed while listening to a tape so the speed of the fading out (i.e., rate at which the control is turned) can be matched to each tape.

Fade In Function

It is also possible to fade sound in on already recorded tapes. First, turn the Fade Out control [17] all the way to the right (clockwise). Then, as the tape is being played, slowly turn the control counterclockwise as far as it will go. Sound will slowly rise from zero to the original recorded level.

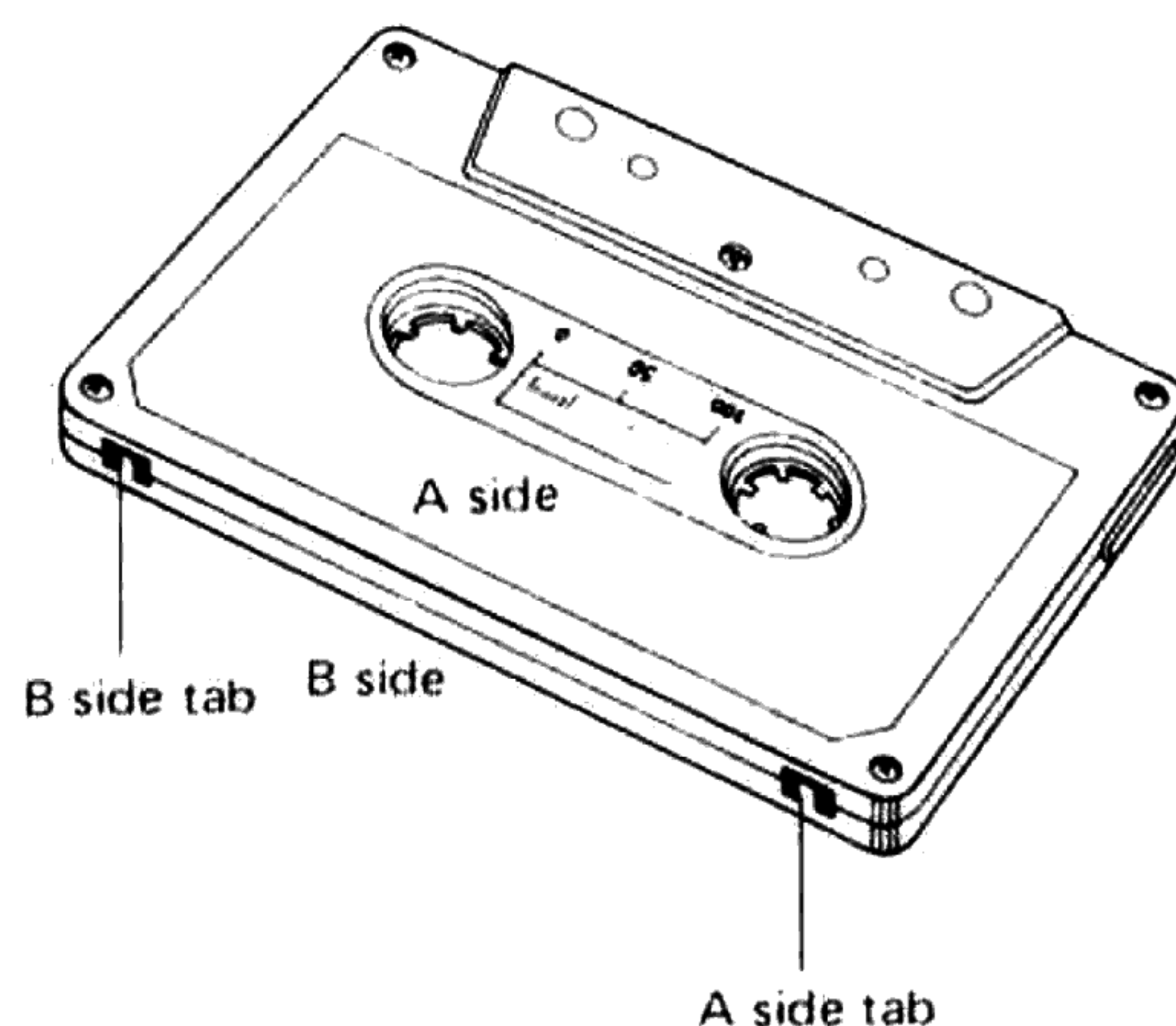
Handling Cassette Tapes

Tape Selector Settings

The TA-2050 is designed to handle all major types of cassette tapes: metal, High, and normal low noise high output tapes. The Bias and Equalization (Eq) settings for a number of major brands are listed in the Tape Selector Guide. Note that the Bias setting is a rough setting. For accurate adjustment (to ensure optimum performance), use the ACCUBIAS circuit.

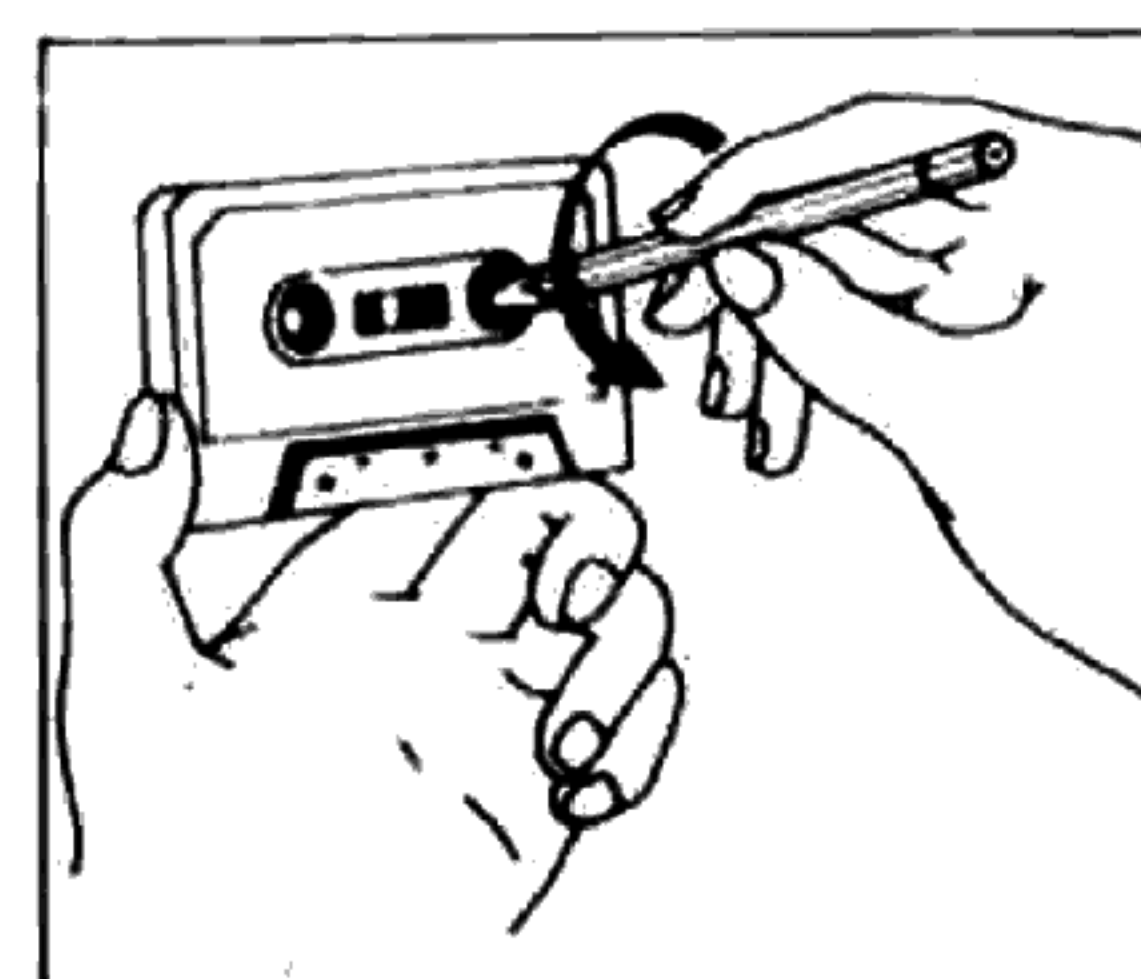
Erase Prevention

Cassette tapes are now constructed with so-called "erase prevention niches" (initially covered by break-off tabs) along the back edge. Once the recording has been completed, simply break off the tab(s) to ensure against accidental erasure (it will no longer be possible to depress the record button with such a tape). If at some later date you wish to re-record that tape, simply cover the openings with small pieces of cellophane tape.



Tape Slack

Slack in the tape (tape not stretched tightly) can cause tangling around the pinch roller and capstan, jamming the mechanism. Remove the tape slack with a pencil or similar device as shown in the diagram.



Memory Stop and Memory Play

This feature is useful for repeated playback of the same section of tape and for rapid relocation of the start of just-recorded material. When the ◀ REW button [11] is depressed, the tape will rewind until the Tape Counter [4] reads '999'. If the Memory switch [5] has been set to the STOP position, the tape will stop. If, however, the memory switch has been set to the PLAY position, the tape will stop momentarily and then start immediately in the playback mode.

1. First reset the tape counter [4] to '000' at the start

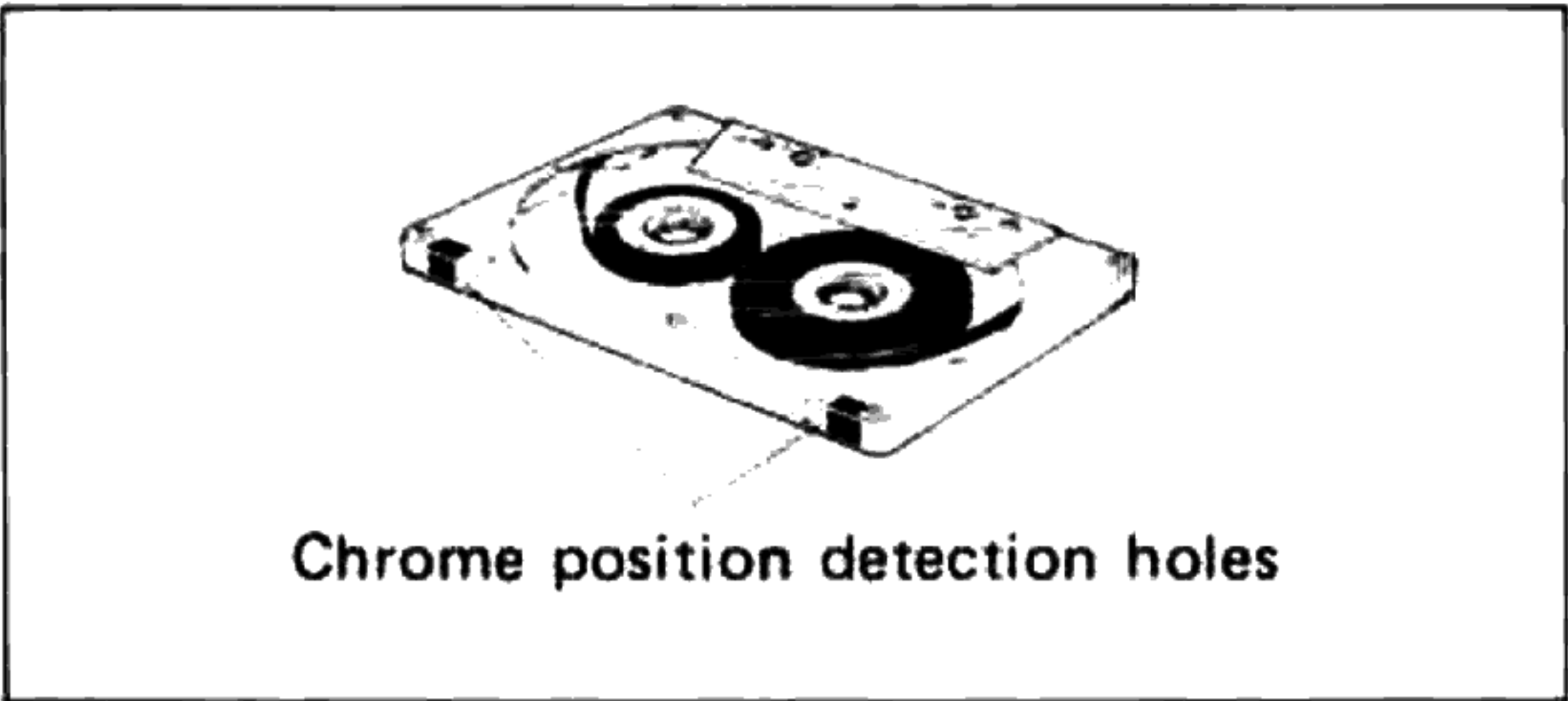
of the section of tape to be played back repeatedly, or at the start of the recording to be made.

2. Set the Memory switch [5] to STOP if the tape is to be rewound and stopped and PLAY if the tape is to be played back after being rewound.
3. After listening to the particular section of tape, or after completing the recording, depress the ◀ REW button [11]. The tape will rewind and stop automatically when the tape counter reads '999' after which it will either stop or be played back depending on the memory switch setting.

TAPE SELECTOR GUIDE

EQ/BIAS (120 μs) NORMAL		EQ/BIAS (70 μs) HIGH		EQ/BIAS (70 μs) METAL	
*MAXELL	XLI 60, 90	*MAXELL	XLII 60, 90	*MAXELL	MX 46, 60
AGFA	SUPER HIGH DYNAMIC C60 +6 SUPER HIGH DYNAMIC C90 +6	AGFA	CHROM C-60, C-90		
AMPEX	GRAND MASTER I AMPEX-60, AMPEX-90	AMPEX	GRAND MASTER II AMPEX-60, AMPEX-90		
BASF	Professional I 60, 90 (Ferro Super LHI) Performance 60 (LH SM) Studio I 60, 90 (Ferro Super LH)	BASF	Professional II 60, 90 (Chrom dioxid Super) Studio II 60, 90 (Chrom dioxid)	BASF	Metal IV BASF 60
FUJI	FL C-60, C-90 FX-1 C-60, C-90	FUJI	FX-II C-60, C-90		
MAXELL	LN C-60, C-90 UD C-60 UD C-90	MAXELL	CR C-60, C-90		
MEMOREX	MEMOREX-90 MRX ₃ (120μ)	MEMOREX	MEMOREX-90 MRX ₃ (70μ)		
RKO	BROADCAST-I C-60 C-90				
SCOTCH	MASTER I C-60, C-90	SCOTCH	MASTER II C-60, C-90	SCOTCH	METAFINE C-46
SONY	LN C-60, C-90 SHF 60, 90 HFX 60, 90 LNX 60, 90	SONY	CR 60, 90 EHF (CD-α) 60, 90	SONY	METALLIC 46 METALLIC 60 METALLIC 90
TDK	AD-C60, C-90 ED-C60, C-90 D-C60, C-90 OD-C60, C-90	TDK	SAC-60, C-90 SA-X C-60	TDK	MA-C46, C60 • MA-R C46, C60

- * THESE TAPES HAVE BEEN DETERMINED TO GIVE BEST PERFORMANCE WITH THIS TAPE DECK. TO RECEIVE OPTIMUM PERFORMANCE FROM A TAPE NOT LISTED, CONSULT THE TAPE MANUFACTURER FOR HIS RECOMMENDATION.
- * WHEN USING FERRI-CHROME TAPES, SET THE TAPE SELECTOR SWITCH [20] TO HIGH AND THE ACCUBIAS ADJUST SWITCH [19] TO '0'.
- On some MA-R cassettes (sold before May 1980) there are no chrome position detection holes. When using such cassettes, turn the ACCUBIAS Adjust switch [19] to the right to position 3, 4 or 5.



- Caution:**
Use of the following types of cassettes may impair performance of the TA-2050:
1. Cassettes with poorly formed cases that rattle during rewind and fast forward.
 2. Low cost cassettes in which there is no guide roller or pressure pad spring should never be used for stereo.
 3. C-120 tapes, because the tape and the coating is extremely thin, distortion levels are high. Also, even a slight stretching of the tape will make it susceptible to being caught up in the pinch roller and capstan.
 4. Endless tapes, if used for a long period of time, can overheat.

Owner Maintenance

This tape deck requires no lubrication.

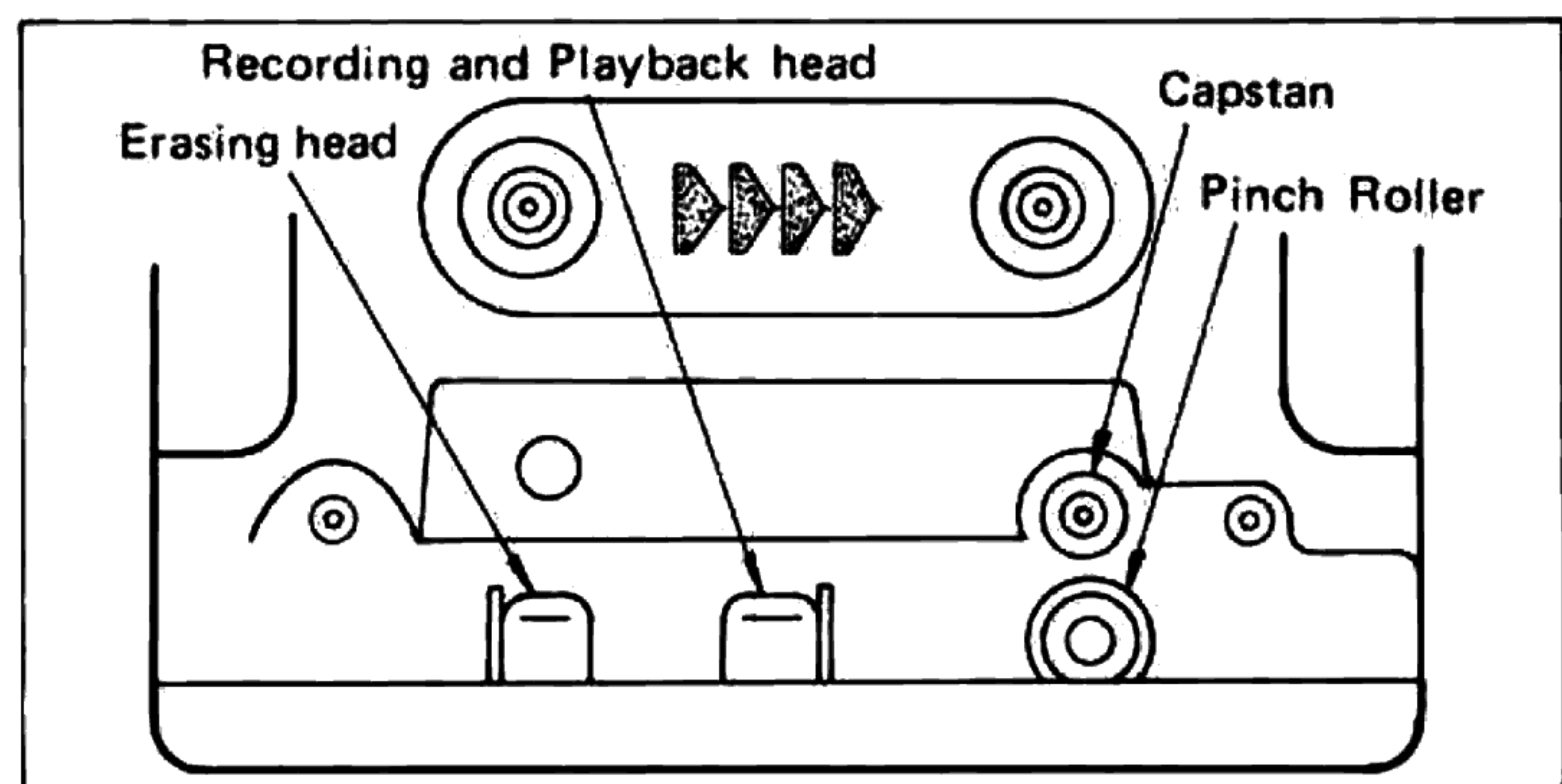
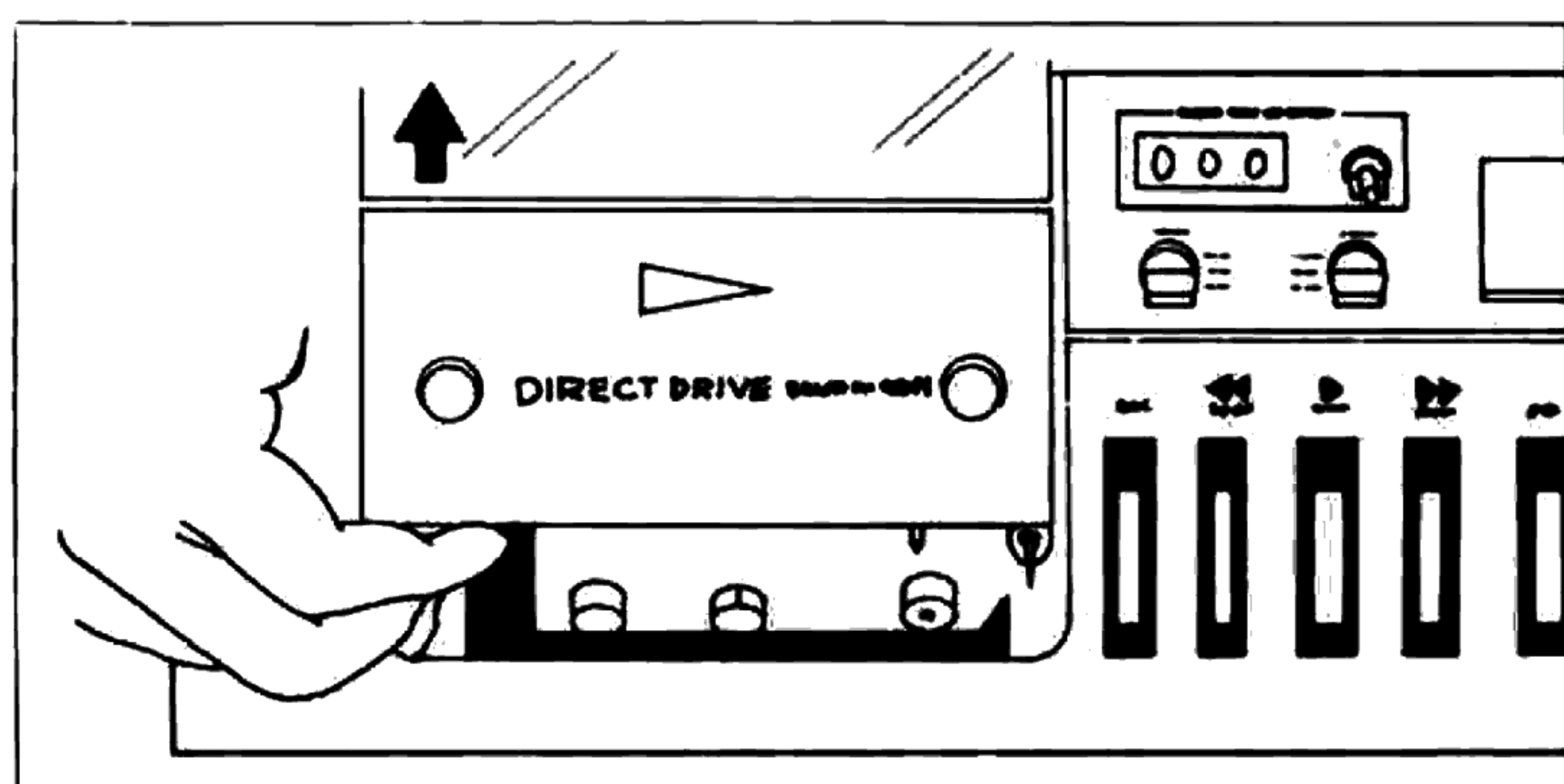
Head Cleaning

Sound quality is greatly influenced by accumulation of magnetic particles on the recording/playback head.

For the clearest possible sound, be sure to clean the head periodically, normally 2 – 3 times a month. A dirty head will cause:

- Poor sound quality (loss of high sounds)
- Decreased volume
- Skipping
- Poor erasing (incomplete erasure of previous recording)

To prevent these problems, clean the head and capstan shaft with a cleaning pen or cotton swab dipped in a little alcohol.



Pinch Roller Cleaning

If the pinch roller is dirty, the tape may become tangled and damaged by wrapping around the roller. Clean the pinch roller when cleaning the head. Use a special cleaner and cotton swab. Head cleaning materials must never be used for the pinch roller.

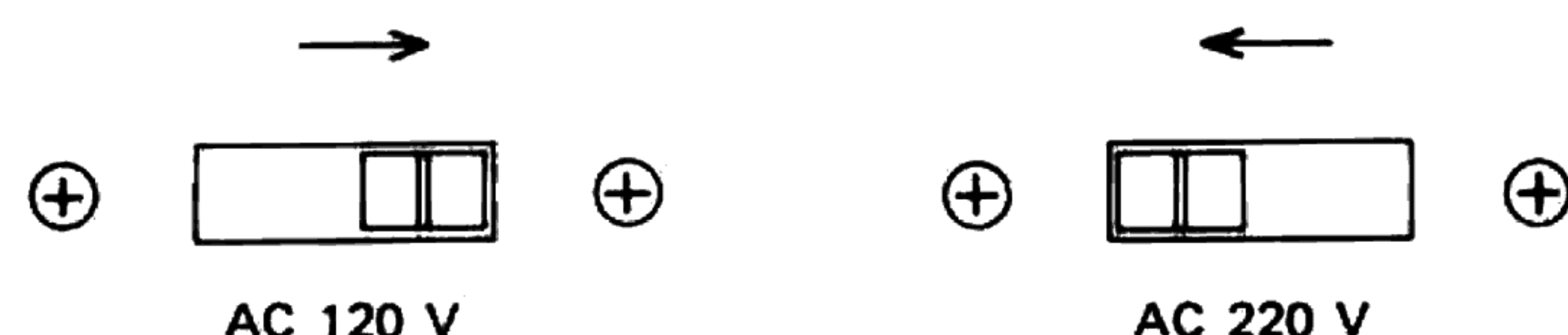
Demagnetizing

Residual magnetism builds up in the head after the cassette deck has been used for a long period of time. This build-up introduces noise and static into recording tapes and lowers the high frequency range. To prevent this, demagnetize the erasing and recording/playback head, as well as other affected metal parts (like the capstan shaft) once every 50 hours of use. Keep the tape deck power OFF while using the demagnetizer. Also place tapes far away from the work area.

Power Supply

Voltage Selector (on Rear Panel)

Some units are equipped with a voltage selector. If the unit you own has a voltage selector, be sure it is set to the proper voltage before the power is turned on. To change the selector to conform to the power supply in your area, insert the tip of a screwdriver in the groove of the switch and slide it all the way to the left or right.



Note:

Units not equipped with a voltage selector can only be used in areas where the power supply agrees with the voltage specified on the rear panel.

ATTENTION the followings, when replacing or mounting a AC PLUG on the Power Supply Cord of this equipment.

*Replacing or Mounting should be performed only by a qualified service personnel.

***IMPORTANT.** The wires in this mains lead are coloured in accordance with the following code:

Blue : Neutral
Brown : Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug proceed as follows:

The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.

The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

Trouble-shooting Guide

The following table lists problems which often do not require professional servicing.
If, however, the problem is not so readily repairable, contact your Onkyo service station for assistance.

Trouble	Cause	Repair
No power.	<ul style="list-style-type: none">• Power cord plug is loose.	<ul style="list-style-type: none">• Insert plug properly into outlet.
Playback but no sound.	<ul style="list-style-type: none">• Hook-up incorrect.• Stereo amplifier input selector switch in wrong position.	<ul style="list-style-type: none">• Check and hook up correctly according to page 4).• Change switch position.
Tape does not turn.	<ul style="list-style-type: none">• Pause button engaged.• Slack tape wound around pinch roller.	<ul style="list-style-type: none">• Release Pause button by pressing.• Take up tape slack with a pencil (see page 6).
Rec button does not engage.	<ul style="list-style-type: none">• No tape in cassette compartment.• Erasure prevention tab(s) punched out.	<ul style="list-style-type: none">• Load cassette tape.• Change tape or cover tab hole with cellophane tape.
Hoarse sound, balance unstable.	<ul style="list-style-type: none">• Playback head dirty.• Tape is stretched.	<ul style="list-style-type: none">• Clean head (see page 8).• Replace tape.
Extensive noise and tape hiss.	<ul style="list-style-type: none">• Head has become magnetized.• High noise level tape.	<ul style="list-style-type: none">• Demagnetize (see page 8).• Replace tape.
Playback distortion.	<ul style="list-style-type: none">• Distortion on tape.	<ul style="list-style-type: none">• Recorded tape is probably bad, but confirm by changing tapes.
Recorded sounds are distorted.	<ul style="list-style-type: none">• Recording is done at too high a level.	<ul style="list-style-type: none">• Readjust Input Level knob. (see page 5).
Tape squeal and skipping.	<ul style="list-style-type: none">• Dirty head, pinch roller, or capstan shaft.• Tape cassette is binding.	<ul style="list-style-type: none">• Clean (see page 8).• Try correcting with Fast Forward and Rewind.
Excessive playback hum	<ul style="list-style-type: none">• Connecting cords not inserted firmly.• External flux leakage from nearby amplifier.	<ul style="list-style-type: none">• Insert plugs firmly.• Move deck away from hum source.
High frequency sounds too strong.	<ul style="list-style-type: none">• Dolby encoded tape played back without Dolby NR.• Tape Selector setting incorrect.	<ul style="list-style-type: none">• Switch Dolby NR In.• Reset Tape Selector.
No high frequency sounds.	<ul style="list-style-type: none">• Non-Dolby encoded tape played back on Dolby NR.• Record/playback head dirty.• Tape Selector setting incorrect.	<ul style="list-style-type: none">• Switch Dolby NR Out.• Clean (see page 8).• Reset Tape Selector.
Fade out mechanism fails to work.	<ul style="list-style-type: none">• Erasure prevention tabs on back edge of tape have been removed.	<ul style="list-style-type: none">• The fade out feature can not be used with tapes where the erasure prevention tabs have been removed.
Timer recording fails to operate - switches automatically to timer playback.	<ul style="list-style-type: none">• Erasure prevention tabs on back edge of tape have been removed.	<ul style="list-style-type: none">• Replace with a cassette which still has the erasure prevention tabs intact

Specifications

Track System:	4-track, 2-channel stereo
Recording System:	AC bias
Erasing System:	AC erase
Tape Speed:	4.8 cm/sec.
Wow and Flutter:	0.045% (WRMS)
Frequency Response:	20 – 17,000 Hz (30 – 16,000 Hz ±3 dB) (normal position tape) 20 – 18,000 Hz (30 – 17,000 Hz ±3 dB) (high position tape) 20 – 19,000 Hz (30 – 18,000 Hz ±3 dB) (metal position tape)
Signal-to-Noise Ratio:	Dolby NR out, 60 dB (metal position tape) A noise reduction of 10 dB above 5 kHz and 5 dB at 1 kHz is possible with the Dolby NR in
Input Jacks:	Microphone Jacks: 2 Minimum input level: 0.3 mV/600Ω Input impedance: 5 kΩ Optimum mic impedance: 600Ω – 50 kΩ Line In: 2 Minimum input level: 50 mV Input impedance: 50 kΩ
Outputs:	Line Out: 2 Output level: 350 mV (at 0 dB) Optimum load impedance: over 50 kΩ Headphone Jack: 1 8 Ω/200 Ω
Motor:	PLL DD motor (capstan) + DC motor
Heads:	Special hard permalloy heads
Components:	TR: 53 Diodes: 29 IC: 6 LED: 4
Power Supply:	AC 120V/60 Hz, 220 V/50 Hz, 120/220 V 50/60 Hz, 240/50 Hz
Power Consumption:	35 W
Dimensions:	418(W) x 120(H) x 270(D) mm 16-1/2" x 4-3/4" x 10-5/8"
Weight:	6.4 kg (14.1 lbs.)
Accessories:	Pin-type connecting cords: 2

* Specifications and external appearance are subject to change without notice because of product improvements.